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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/673,388	09/30/2003	Chih-Tsung Shih	1651-0163P	3746

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BIRCH STEWART KOLASCH & BIRCH
PO BOX 747
FALLS CHURCH, VA 22040-0747

EXAMINER	
LAVARIAS, ARNEL C	

ART UNIT	PAPER NUMBER
2872	

DATE MAILED: 12/01/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/673,388	SHIH ET AL.	
	Examiner	Art Unit	
	Arnel C. Lavarias	2872	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 October 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-6* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. The amendments to Claim 1 in the submission dated 10/5/06 are acknowledged and accepted.

2. The cancellation of Claim 9 in the submission dated 10/5/06 is acknowledged and accepted.

Response to Arguments

3. The Applicants argue that, with respect to newly amended Claim 1, as well as Claims 2-6 and 9 which depend on Claim 1, the combined teachings of Fan, Tehrani, and Pedrotti et al. fail to teach or reasonably suggest the first and second collimators both including an inclined plane. After reviewing Fan, Tehrani, and Pedrotti et al., the Examiner agrees, and respectfully withdraws the rejections in Sections 11-14 of the Office Action dated 5/8/06.

4. Claims 1-6 are now rejected as follows.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1, 3-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fan (U.S. Patent No. 6807342), of record, in view of Tehrani (U.S. Patent No. 5430574), of record, Pan (U.S. Patent No. 5359683), and Pedrotti et al. (F. L. Pedrotti, L. S. Pedrotti, 'Introduction to optics', Prentice Hall, New Jersey, 1993, pp. 30-36.), of record.

Fan discloses a tunable filter (See Abstract; Figures 2, 4; col. 2, line 13-col. 3, line 17) with a wide free spectral range, comprising a first optical fiber (See for example 24 in Figure 2, 24' in Figure 4); a second optical fiber (See for example 22 in Figure 2, 22' in Figure 4) with one end opposed to the first optical fiber, wherein a high reflectivity layer (See for example 19 in Figure 2, 19' in Figure 4) is coated on the end of the second optical fiber (See for example 19' in Figure 4); and a MEMS-based one-piece reflector (See for example 12, 13, 14, 16, 18, spacer between 16 and 13 in Figure 2; 13, 14, 18', spacer and grounded layer in Figure 4; wherein all of these layers have been taken, as a whole, to be a single piece) interposed between the first optical fiber and the second optical fiber, the reflector comprising a base (See for example 16 in Figure 2), an aperture (See central portion of layer 16) defined in the base, and a multilayered film (See 12, 18 in Figure 2) with high reflection capability formed on the base and extending over the aperture, wherein the multilayer film extending over the aperture serves as a curved lens (See 12, 18 in Figure 2; 25 in Figure 6), the curved lens having no contact with the base (See curved lens 12, 18, and base 16 in Figure 2), and a resonance cavity is defined between the curved lens and the second collimator to determine a resonance frequency (See 18, 19 in Figure 2, 18', 19' in Figure 4; wherein the resonance frequency for a Fabry-Perot resonance cavity is necessarily as disclosed as Equation 1 (See col. 4) in

Fan). Fan further discloses the multilayered film formed with alternate layers of GaAs and AlAs or alternate layers of TiO_2 and SiO_2 (See col. 2, lines 22-65); the tunable filter being an electrostatic actuated type filter (See col. 2, lines 22-65), and the MEMS-based one-piece reflector further comprising a dielectric layer and an electrode layer sequentially formed on the base, both the dielectric layer and the electrode layer having an opening corresponding to the aperture (See for example 13, 14 in Figure 2); the first optical fiber having one end extending toward the second optical fiber (See for example 22, 24 in Figure 2; 22', 24' in Figure 4); and the second fiber (See 22 in Figure 2; 22' in Figure 4 of Fan) carrying an optical input signal to the tunable filter and the first fiber (See 24 in Figure 2; 24' in Figure 4 of Fan) carrying an optical output signal from the tunable filter.

Fan lacks the first and second optical fibers including collimators with an inclined plane; and the first fiber/collimator carrying an optical input signal to the tunable filter and the second fiber/collimator carrying an optical output signal from the tunable filter. However, Tehrani teaches a tunable filter with a wide free spectral range (See for example Figures 3-7 of Tehrani), comprising a first collimator on a first optical fiber (See 14 in Figure 3 of Tehrani); a second collimator on a second optical fiber and opposed to the first collimator (See 15 in Figure 3 of Tehrani); and a mirror (See 21 in Figure 3 of Tehrani) interposed between the first and second collimators, with an appropriate tilt angle (It is noted that the surface of the mirror at the point of light incidence is tilted orthogonally to the propagation axis of the incident light) and a high reflectivity lens, such as a concave lens (It is noted that the mirror 21 provides a surface with a concave

curvature which will also inherently provide a lensing/focusing function to the incident light reflected back from element 21 in Figure 3 of Tehrani), whereby a resonance cavity is defined in a space between the mirror and the second collimator (See space between 21 and 22 in Figure 3 of Tehrani). In addition, Pan teaches conventional fiber optic based collimators (See in particular Figures 3-5 of Pan), wherein such conventional fiber optic collimators include a cylindrical glass ferrule (See 24 in Figures 3-4 of Pan), a graded index lens (GRIN lens) (See 21 in Figures 3-4 of Pan), and a hollow cylindrical holder (See 30 in Figures 3-4 of Pan). In addition, Pan teaches that the fiber optic collimators include a slanted surface (See 24A in Figure 4 of Pan) with an anti-reflection (AR) coating (See 24A, 29 in Figure 4; col. 3, lines 47-59 of Pan). Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have the first and second optical fibers of the tunable filter of Fan include collimators with an inclined plane, as taught by Tehrani and Pan, for the purpose of mode matching and focusing the incident light to reduce optical losses, while reducing insertion loss and minimize reflections at the surfaces.

The combined teachings of Fan, Tehrani, and Pan lack the first fiber/collimator carrying an optical input signal to the tunable filter and the second fiber/collimator carrying an optical output signal from the tunable filter. However, Pedrotti et al. teaches the well known law of reversibility or law of reciprocity (See specifically Section 3-3 of Pedrotti et al.), which is based on Fermat's principle, wherein any ray of light in an optical system, if reversed in direction, will retrace the same path backward. Thus, based on this principle, if the first fiber (See 24 in Figure 2; 24' in Figure 4 of Fan) carries an

optical input signal to the tunable filter and the second fiber (See 22 in Figure 2; 22' in Figure 4 of Fan) carries an optical output signal from the tunable filter, it is expected that the optical paths through the tunable filter will be the same. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have the first fiber/collimator carry an optical input signal to the tunable filter and the second fiber/collimator carry an optical output signal from the tunable filter, as taught by Pedrotti et al., in the tunable filter of Fan, Tehrani, and Pan, to allow for bi-directional light propagation in the tunable filter.

7. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fan in view of Tehrani, Pan, and Pedrotti et al., as applied to Claim 1 above, and further in view of Domash (U.S. Patent Application Publication US 2003/0072009 A1), of record.

Fan in view of Tehrani, Pan, and Pedrotti et al. discloses the invention as set forth above in Claim 1, except for the tunable filter being a heat actuated type filter. However, the use of heat-, piezoelectric-, and electrostatic-based actuators to adjust the Fabry-Perot reflector spacing to provide center wavelength tunability is well known and conventional in the art. For example, Domash et al. teaches a tunable thin film Fabry-Perot filter (See for example 101 in Figure 1), wherein central wavelength tunability is provided for by the use of a heat conducting film resistor deposited onto the Fabry-Perot filter, the film resistor being connected to a temperature controller (See 102 in Figure 1; Figures 3-9; Paragraphs 0059-0068). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have the tunable filter of Fan in view of Tehrani, Pan, and Pedrotti et al., be a heat actuated type filter, as taught by Domash et

al. for the purpose of providing rapid, repeatable, and wide shifts in the transmission wavelengths of the filter without use of moving parts.

8. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fan in view of Tehrani, Pan, and Pedrotti et al. as applied to Claim 1 above, and further in view of Huang (U.S. Patent No. 6263128), of record.

Fan in view of Tehrani, Pan, and Pedrotti et al. discloses the invention as set forth above in Claim 1, except for an antireflection layer coated on the end of the first collimator. However, the use of antireflective coatings of surfaces of optical elements, such as collimators and lenses, are well known and standard practice in the art. For example, Huang teaches a particular embodiment of a Fabry-Perot etalon filter (see for example Figures 6-7), wherein the surfaces of one or both of the collimators (See 71, 72 in Figure 7) may be coated with an antireflective film (See 77 in Figure 7). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have an antireflection layer be coated on the end of the first collimator, as taught by Huang, in the tunable filter of Fan in view of Tehrani, Pan, and Pedrotti et al., for the purposes of reducing optical noise due to unwanted back reflections in the incident signal.

Conclusion

9. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Arnel C. Lavarias whose telephone number is 571-272-2315. The examiner can normally be reached on M-F 9:30 AM - 6 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Drew Dunn can be reached on 571-272-2312. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Arnel C. Lavarias
Primary Examiner
Group Art Unit 2872
11/28/06

ARNEL LAVARIAS
PRIMARY PATENT EXAMINER